

WHAT IS CLAIMED IS:

1 1. An antenna, comprising:
2 a first antenna array, comprising:
3 one or more antenna elements of a first antenna element type in a first
4 region of the antenna array; and
5 a plurality of antenna elements of a second antenna element type in a
6 second region of the antenna array.

1 2. The antenna as recited in claim 1, wherein the first region of the first
2 antenna array is a central region, and the second region of the first antenna array is a region
3 outside of the central region.

1 3. The antenna as recited in claim 1, wherein the first antenna array
2 comprises a spacecraft antenna mounted on a spacecraft bus.

1 4. The antenna as recited in claim 1, wherein the first antenna array
2 comprises a deployed spacecraft antenna.

1 5. The antenna as recited in claim 1, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type comprises a
3 planar element type.

1 6. The antenna as recited in claim 1, wherein first antenna element type
2 comprises a helical antenna element type of a first length, and the second antenna element
3 type comprises a helical antenna element of a second length.

1 7. The antenna as recited in claim 1, wherein the one or more antenna
2 elements of the first antenna element type are configured on a spacecraft bus, and the
3 plurality of antenna elements of the second antenna element type are configured on one or
4 more deployed panels.

1 8. The antenna as recited in claim 7, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type comprises a
3 planar antenna element.

1 9. The antenna as recited in claim 1, wherein the one or more antenna
2 elements of the first antenna element type and the plurality of antenna elements of the second
3 antenna element type are configured on a spacecraft bus, and wherein the first antenna array
4 comprises a plurality of antenna elements of a third antenna element type configured on one
5 or more deployed panels.

1 10. The antenna as recited in claim 9, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type and the third
3 antenna element type comprise planar antenna elements.

1 11. The antenna as recited in claim 9, wherein the first antenna element
2 type comprises a helical antenna element of a first length, the second antenna element type
3 comprises a helical antenna element of a second length, and the third antenna element type
4 comprises a planar antenna element.

1 12. The antenna as recited in claim 1, further comprising a second antenna
2 array comprising one or more antenna elements.

1 13. The antenna as recited in claim 12, wherein at least some of the one or
2 more antenna elements of the second antenna array are of the first antenna element type.

1 14. The antenna as recited in claim 12, wherein at least some of the one or
2 more antenna elements of the second antenna array are of the second antenna element type.

1 15. The antenna as recited in claim 12, wherein the one or more antenna
2 elements of the second antenna array comprise antenna elements of the first antenna element
3 type and the second antenna element type.

1 16. The antenna as recited in claim 12, wherein the second antenna array
2 has a coincident or overlapping frequency band as the first antenna array.

1 17. The antenna as recited in claim 12, wherein the one or more antenna
2 elements of the second antenna array are interleaved with at least a portion of the antenna
3 elements of the first antenna array.

1 18. The antenna as recited in claim 17, wherein the antenna elements of
2 the first antenna array that are interleaved with the one or more antenna elements of the

3 second antenna array are of the first antenna element type, and at least a portion of the
4 antenna elements of the first antenna array that are not interleaved with the one or more
5 antenna elements of the second antenna array are of the second antenna element type.

1 19. The antenna as recited in claim 12, wherein the antenna elements of
2 the first antenna array and the one or more antenna elements of the second antenna array are
3 configured on a spacecraft bus.

1 20. The antenna as recited in claim 12, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array and the one or more
3 antenna elements of the second antenna array are configured on a spacecraft bus, and the
4 plurality of antenna elements of the second antenna element type of the first antenna array are
5 configured on one or more deployed panels.

1 21. The antenna as recited in claim 20, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array and the one or more
3 antenna elements of the second antenna array are interleaved, and wherein the first antenna
4 element type comprises a helical antenna element, the second antenna element type
5 comprises a planar antenna element, and the one or more antenna elements of the second
6 antenna array comprise helical antenna elements.

1 22. The antenna as recited in claim 12, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array, the plurality of antenna
3 elements of the second antenna element type of the first antenna array, and the one or more
4 antenna elements of the second antenna array are configured on a spacecraft bus, and wherein
5 the first antenna array comprises a plurality of antenna elements of a third antenna element
6 type configured on one or more deployed panels.

1 23. The antenna as recited in claim 22, wherein the first antenna element
2 type comprises a helical antenna element, the second antenna element type and the third
3 antenna element type comprise planar antenna elements, and the one or more antenna
4 elements of the second antenna array comprise helical antenna elements.

1 24. The antenna as recited in claim 22, wherein the first antenna element
2 type comprises a helical antenna element of a first length, the second antenna element type
3 comprises a helical antenna element of a second length, the one or more antenna elements of

4 the second antenna array comprise helical antenna elements of a third length, and the third
5 antenna element type comprises a planar antenna element.

1 25. The antenna as recited in claim 24, wherein the first length, the second
2 length and the third length may all be different lengths, or two or more of the first length, the
3 second length and the third length may be the same length.

1 26. The antenna as recited in claim 12, wherein the first antenna array
2 comprises a Navigation Warfare Global Positioning System antenna.

1 27. The antenna as recited in claim 12, wherein the second antenna array
2 comprises a Earth Coverage Global Positioning System antenna.

1 28. The antenna array as recited in claim 12, wherein at least one of the
2 first antenna array and the second antenna array comprises a phased array antenna.

1 29. The antenna array as recited in claim 12, wherein at least one of the
2 first antenna array and the second antenna array comprises an active phased array antenna.

1 30. The antenna as recited in claim 12, further comprising a third antenna
2 array comprising one or more antenna elements.

1 31. A spacecraft, comprising:
2 a spacecraft bus; and
3 a first antenna array, comprising:
4 one or more antenna elements of a first antenna element type in a first
5 region of the antenna array; and
6 a plurality of antenna elements of a second antenna element type in a
7 second region of the antenna array.

1 32. The spacecraft as recited in claim 31, wherein the first region of the
2 first antenna array is a central region, and the second region of the first antenna array is a
3 region outside of the central region.

1 33. The spacecraft as recited in claim 31, wherein the first antenna array
2 comprises a spacecraft antenna mounted on a spacecraft bus.

1 34. The spacecraft as recited in claim 31, wherein the first antenna array
2 comprises a deployed spacecraft antenna.

1 35. The spacecraft as recited in claim 31, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type comprises a
3 planar element type.

1 36. The spacecraft as recited in claim 31, wherein first antenna element
2 type comprises a helical antenna element type of a first length, and the second antenna
3 element type comprises a helical antenna element of a second length.

1 37. The spacecraft as recited in claim 31, wherein the one or more antenna
2 elements of the first antenna element type are configured on a spacecraft bus, and the
3 plurality of antenna elements of the second antenna element type are configured on one or
4 more deployed panels.

1 38. The spacecraft as recited in claim 37, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type comprises a
3 planar antenna element.

1 39. The spacecraft as recited in claim 31, wherein the one or more antenna
2 elements of the first antenna element type and the plurality of antenna elements of the second
3 antenna element type are configured on a spacecraft bus, and wherein the first antenna array
4 comprises a plurality of antenna elements of a third antenna element type configured on one
5 or more deployed panels.

1 40. The spacecraft as recited in claim 39, wherein the first antenna element
2 type comprises a helical antenna element, and the second antenna element type and the third
3 antenna element type comprise planar antenna elements.

1 41. The spacecraft as recited in claim 39, wherein the first antenna element
2 type comprises a helical antenna element of a first length, the second antenna element type
3 comprises a helical antenna element of a second length, and the third antenna element type
4 comprises a planar antenna element.

1 42. The spacecraft as recited in claim 31, further comprising:

2 a second antenna array comprising one or more antenna elements.

1 43. The spacecraft as recited in claim 42, wherein at least some of the one
2 or more antenna elements of the second antenna array are of the first antenna element type.

1 44. The spacecraft as recited in claim 42, wherein at least some of the one
2 or more antenna elements of the second antenna array are of the second antenna element type.

1 45. The spacecraft as recited in claim 42, wherein at least some of the one
2 or more antenna elements of the second antenna array comprise antenna elements of the first
3 antenna element type and the second antenna element type.

1 46. The spacecraft as recited in claim 42, wherein the second antenna array
2 has a coincident or overlapping frequency band as the first antenna array.

1 47. The spacecraft as recited in claim 42, wherein the one or more antenna
2 elements of the second antenna array are interleaved with at least a portion of the antenna
3 elements of the first antenna array.

1 48. The spacecraft as recited in claim 47, wherein the antenna elements of
2 the first antenna array that are interleaved with the one or more antenna elements of the
3 second antenna array are of the first antenna element type, and at least a portion of the
4 antenna elements of the first antenna array that are not interleaved with the one or more
5 antenna elements of the second antenna array are of the second antenna element type.

1 49. The spacecraft as recited in claim 42, wherein the antenna elements of
2 the first antenna array and the one or more antenna elements of the second antenna array are
3 configured on a spacecraft bus.

1 50. The spacecraft as recited in claim 42, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array and the one or more
3 antenna elements of the second antenna array are configured on a spacecraft bus, and the
4 plurality of antenna elements of the second antenna element type of the first antenna array are
5 configured on one or more deployed panels.

1 51. The spacecraft as recited in claim 50, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array and the one or more
3 antenna elements of the second antenna array are interleaved, and wherein the first antenna

4 element type comprises a helical antenna element, the second antenna element type
5 comprises a planar antenna element, and the one or more antenna element of the second
6 antenna array comprise helical antenna elements.

1 52. The spacecraft as recited in claim 42, wherein the one or more antenna
2 elements of the first antenna element type of the first antenna array, the plurality of antenna
3 elements of the second antenna element type of the first antenna array, and the one or more
4 antenna elements of the second antenna array are configured on a spacecraft bus, and wherein
5 the first antenna array comprises a plurality of antenna elements of a third antenna element
6 type configured on one or more deployed panels.

1 53. The antenna as recited in claim 52, wherein the first antenna element
2 type comprises a helical antenna element, the second antenna element type and the third
3 antenna element type comprise planar antenna elements, and the one or more antenna
4 elements of the second antenna array comprise helical antenna elements.

1 54. The antenna as recited in claim 52, wherein the first antenna element
2 type comprises a helical antenna element of a first length, the second antenna element type
3 comprises a helical antenna element of a second length, the one or more antenna elements of
4 the second antenna array comprise helical antenna elements of a third length, and the third
5 antenna element type comprises a planar antenna element.

1 55. The antenna as recited in claim 54, wherein the first length, the second
2 length and the third length may all be different lengths, or two or more of the first length, the
3 second length and the third length may be the same length.

1 56. The spacecraft as recited in claim 42, wherein the first antenna array
2 comprises a Navigation Warfare Global Positioning System antenna.

1 57. The spacecraft as recited in claim 42, wherein the second antenna array
2 comprises a Earth Coverage Global Positioning System antenna.

1 58. The spacecraft as recited in claim 42, wherein at least one of the first
2 antenna array and the second antenna array comprises a phased array antenna.

1 59. The spacecraft as recited in claim 42, wherein at least one of the first
2 antenna array and the second antenna array comprises an active phased array antenna.

1 60. The spacecraft as recited in claim 42, further comprising a third
2 antenna array comprising one or more antenna elements.